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WO 94/25999 A1 US 5170173 A

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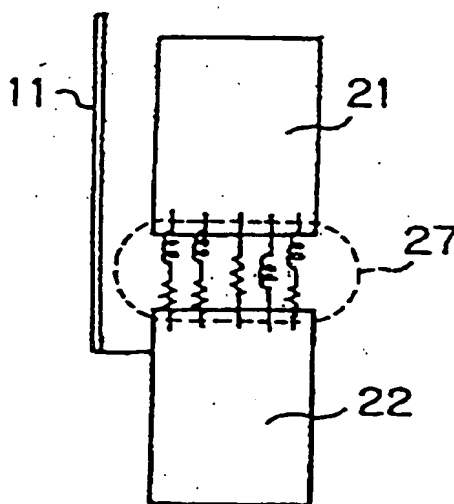
INT CL⁶ H01Q 1/24, H04B 1/38, H04M 1/02

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(54) Portable telephone handset in which the electrical connexion between two folding sections has resistive or inductive high frequency blocks

(57) A folding telephone handset has an aerial connected to a lower section. Inductive and/or resistive lines join the lower section to an upper section, these preventing high frequency disturbances from reaching the lower section. This improves the radiation efficiency and pattern and maintains the bandwidth.

Fig. 6



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Fig. 1

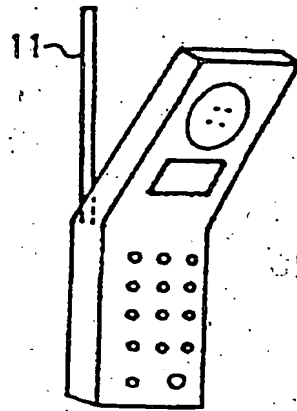


Fig. 3

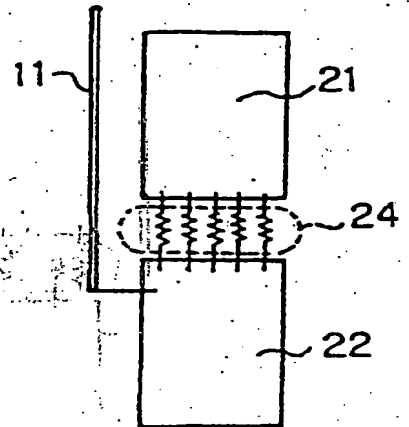


Fig. 2

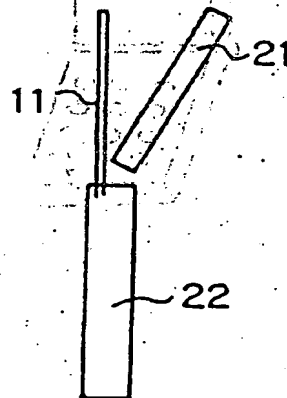


Fig. 4

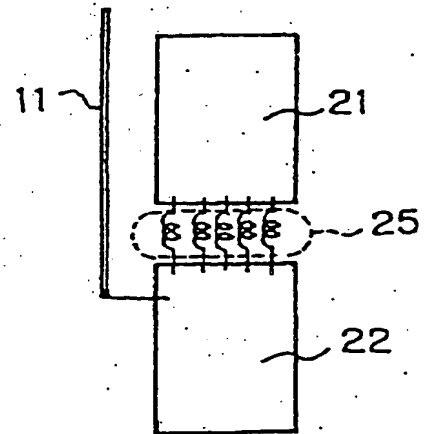


Fig. 5

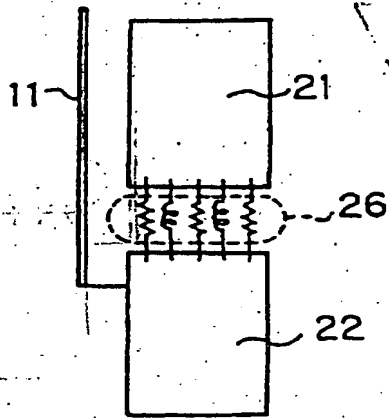


Fig. 6

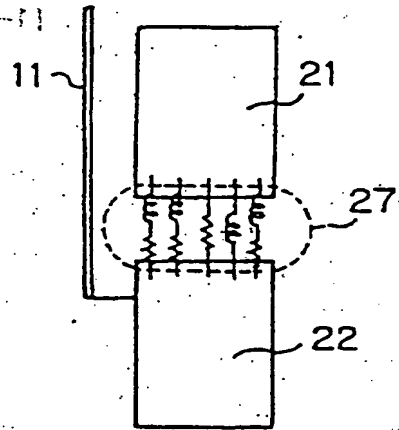
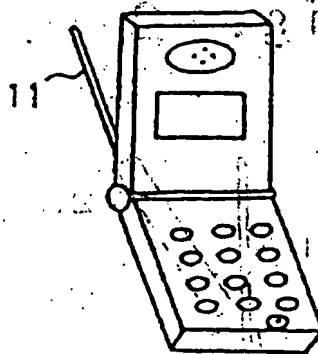


Fig. 7



PORTABLE RADIO.

The present invention relates to a portable radio, and it will be illustrated, by way of example, with reference to an arrangement having a connection for connecting upper and lower unit sections of a flexed unit when an antenna is fitted to a flexion portion of the flexed unit.

With regard to the form of a portable radio which is used by being pressed against the ear of a human body, as with a portable telephone unit, a method for equipping a flexion portion of the unit with an antenna has been proposed in order to lessen the effect on the human body of electromagnetic waves by locating the antenna apart from the human body during conversations, and in order to improve the radiation efficiency and radiation pattern of the antenna.

A portable telephone with the above described structure poses the problem that a metal portion over the antenna portion causes a deterioration in the radiation efficiency of the antenna and produces the effect that the frequency bandwidth is narrowed during the operation of the antenna. To cope with this, in Japanese Patent Laid-Open No. Hei 4-127723, a portable radio has been proposed, which has a structure in which the antenna

projects from the unit downwardly in order to reduce the effect of the user's head on the antenna. However, such a portable radio still gives concern, in that the radiation pattern will be affected since the user's body shields the antenna.

If there is no influence of a metal portion of a radio on the antenna, in a portable radio which is used by pressing it against the ear of the human body, as in a portable telephone, the radiation efficiency of the antenna and the deterioration of the radiation pattern are improved and the effect of narrowing the operating frequency bandwidth is relieved, whereby it will be possible to locate the antenna separated from the human body. Therefore, it is necessary to reduce the influence of the metal portion over the antenna on it.

Features of a portable radio which is to be described below, by way of example, in illustration of the invention are that it is capable of improving the protection of a human body from electromagnetic radiations and of improving the radiation efficiency and the radiation pattern of an antenna, without having an adverse effect caused by a metal portion of the radio on the antenna.

In a particular embodiment of a portable radio which has an antenna fitted to a flexion portion of the unit, and which is to be described below, by way of example in illustration of the invention, there are upper and lower circuit portions which are arranged in each of upper and

lower unit sections of the flexed unit, the upper and lower circuit portions being divided interposing a fitting portion of the antenna to the flexion portion, an external conduction body outside the unit, connection lines which connect the upper and lower circuit portions and the conduction body, and impedances each of the impedances being arranged in the middle of a corresponding one of the connection lines, the impedances serving to reduce the conduction of a high frequency current between the upper and lower circuit portions.

The impedances which reduce the conduction of the high frequency current between the upper and the lower circuit portions may be in the form of resistors or inductors.

Furthermore, some of the impedances which reduce the conduction of the high frequency current between the upper and lower circuit portions may be inductors and some may be resistors, or they may be combinations of resistors and respective elements such as inductors.

The flexed unit may be a folding unit, and the antenna may be placed at a hinge portion of the folding unit.

Arrangements illustrative of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic perspective view of a portable radio;

Fig. 2 is a diagrammatic side view showing an

antenna, an upper circuit, and a lower circuit of the portable radio,

Fig. 3 is a diagrammatic front elevation view of a first embodiment illustrative of the present invention, wherein a resistor is connected to a connection line,

Fig. 4 is a diagrammatic front elevation view of a second embodiment illustrative of the present invention, wherein an inductor is connected to a connection line,

Fig. 5 is a diagrammatic front elevation view of a modification of the second embodiment illustrative of the present invention, wherein the resistor and the inductor are selectively connected to a connection line,

Fig. 6 is a diagrammatic front elevation view of a modification of the second embodiment illustrative of the present invention, wherein resistors and inductors connected in series are selectively connected to a connection line, and

Fig. 7 is a perspective view of a folding unit of a portable radio illustrative of the present invention when it is unfolded.

A portable radio to be described below includes a resistor and an inductor inserted into a connection line which connects upper and lower circuits disposed in an interposing flexion portion of a unit.

Specifically, an antenna 11 is arranged at the flexion portion (see Fig. 1), and an electric circuit is divided into upper and lower circuit portions 21 and 22 having a portion of an antenna fitted to a unit (see Fig.

2). A plurality of connection lines 24 (see Fig. 3), which connect the upper and lower circuit portions 21 and 22 includes resistors (Fig. 3). The antenna is electrically connected to the lower circuit portion 22 (see Fig. 2).

Moreover, instead of the resistors 24 (see Fig. 3), an impedance may be provided by an inductor or by inductors and resistors in series. Different combinations of inductor, resistor, or inductor and resistor may be used in different connection lines or an inductor may be used in every connection line for the convenience of the circuit. A series circuit composed of a resistor and an inductor may be arranged in each connection line.

The portable radio to be described in illustration of the present invention, provides high frequency separation of the upper and lower circuit portions 21 and 22 by means of resistors 24. For this reason, the influence of the upper circuit portion 21 on the antenna connected to the lower circuit portion 22 may be reduced, enabling the radiation efficiency and the radiation pattern to be improved. Thus, the possibility of a reduction in the frequency bandwidth may be minimised.

In the embodiment illustrative of the present invention to be described with reference to Fig. 2, the antenna 11 is connected to the lower circuit portion 22, and a resistor is arranged in the middle of each

connection line for connecting the upper and lower circuit portions 21 and 22.

Subsequently, the operation of this embodiment will be described with reference to Fig. 3.

A high frequency current induced by the antenna 11 is distributed in the lower circuit portion 22 as well as on the antenna 11. Here, if the upper and lower circuit portions 21 and 22 are simply connected with electrical wires, the previously mentioned high frequency current is also distributed in the upper circuit portion 21.

The high frequency current distributed in the upper circuit portion 21 generates an electric field and disturbs the electric field inherently generated by the high frequency current distributed by the antenna 11.

That is, since the upper circuit portion 21 is connected to the lower circuit portion 22, the characteristics of the antenna 11, i.e., the radiation efficiency, the radiation pattern and the like, are caused to

deteriorate. Hence, if there is high frequency isolation between the upper and lower circuit portions 21 and 22, the high frequency current distribution in the upper circuit portion 21 is reduced, so that the radiation efficiency and radiation pattern of the antenna 11 become

approximately equal to that in the case where the upper circuit portion 21 does not exist. For this reason, as shown in Fig. 3, a resistor is inserted into the

connection line 24 for connecting the upper and lower

circuit portions 21 and 22 in order to make the connection line 24 have a high impedance, thereby producing an isolated condition.

5 Next, a further embodiment illustrative of the present invention will be described with reference to

10 Fig. 4. In the first mentioned embodiment, a resistor is inserted into the connection line 24. However, in the arrangement shown in Fig. 4, an inductor 25 is inserted
10 into the connection line 24.

15 Furthermore, in a modification of this further embodiment, as shown by reference numeral 26 in Fig. 5, a resistor and an inductor are used alternately in the connection lines. In addition, as another modification
15 of this further embodiment, a resistor and an inductor connected in series may be used selectively, whereby the same effects can be obtained (see reference numeral 27 in Fig. 6).

20 It is natural that for the flexion unit, the arrangements described are effective using a folding unit, as shown in Fig. 7.

25 The effect of the arrangements described is that there is a reduction in the distribution of the high frequency current which is induced in the upper circuit portion from the antenna. Thus, deterioration in the radiation efficiency and in the radiation pattern of the antenna are reduced. Therefore, it is possible to fit the antenna to the flexion portion of the radio unit

without adversely affecting the operation of the antenna. Thus, it is possible to provide a portable radio apparatus, such as the portable telephone, having a structure such that it can be used in a way in which elements are spaced apart from the human body.

Although the preferred embodiments illustrative of the present invention has been described by way of example, it will be understood that variations and modifications thereof, as well as other embodiments may be made without departing from the scope of the protection sought by the appended claims.

CLAIMS

1. A portable radio having an antenna fitted to a flexion portion of a flexed unit, upper and lower circuit portions of the radio being arranged in respective upper and lower unit sections of the flexed unit, the upper and lower circuit portions being divided and interposed by an antenna fitted to the flexion portion, an external conducting body on the outside of the unit, a plurality of connection lines which connect the upper and lower circuit portions and the conduction body, and a plurality of elements, each being arranged in a corresponding one of the connection lines, the elements serving to reduce the conduction of high frequency current between the upper and lower circuit portions.

2. A portable radio as claimed in claim 1, wherein each element which reduces the conduction of the high frequency current between the upper and lower circuit portions is a resistor.

3. A portable radio as claimed in claim 1, wherein each element which reduces the conduction of the high frequency current between the upper and lower circuit portions is an inductor.

4. A portable radio as claimed in claim 1, wherein some of the elements which reduce the conduction of the



The Patent Office

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Application No: GB 9706474.5
Claims searched: 1-7

Examiner: David Midgley
Date of search: 29 April 1997

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H3Q QACA, QAA, QAK, QAX

Int Cl (Ed.6): H01Q 1/24 H04B 1/38 H04M 1/02

Other: ONLINE:WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	WO 94/25999 A1 (MOTOROLA)	1
"	US 5170173 (MOTOROLA)	"

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

high frequency currents between the upper and lower circuit portions are resistors, and other of the elements are inductors.

5. A portable radio as claimed in claim 2, wherein at least one of the elements which reduces the conduction of the high frequency current between the upper and the lower circuit portions in the connection lines includes an inductor.

10

6. A portable radio as claimed in anyone of claims 1 to 5, wherein the flexed unit is a folding unit, and the antenna is placed at a hinge portion of the folding unit.

15

7. A portable radio as claimed in claim 1 substantially as described herein with reference to any one of the figures of the accompanying drawings.

